Spindt cathodes based on molybdenum tips could serve as an example of the field emission devices. Devices based on semiconductor (silicon) field emitters are more suitable for applications because the materials and their technology is less expensive.

Field emission devices based on silicon tips prepared from silicon whiskers (filamentary crystals) are known in the art. In particular, a device that uses the resistance of the silicon emitter itself as a ballast resistance, that is important for field-emission displays (FED), has been realized. In addition, the emitter was coated by diamond for increasing of the emission ability and of its durability. This allows to increase the efficiency of the emission owing to the increase of number of emitters having the same spatial coordinate. Accordingly, a given pixcell can increase the emissivity brightness several times.

Carbon nanotubes on flat substrates used in the field emitters are known. However, parameters of such emitters are not reproducible because distributions of electric fields between the nanotubes are non-uniform due to their occasional positions.

Scanning probe microscopes (SPM) are able to provide images of solid surfaces with high spatial resolutions. Using carbon nanotubes attached to the probes is known. However, their position at the probe is non-controllable due to their occasional and numerous nucleations.

The SPM can be used for study of magnetic objects with a high resolution and high sensitivity. Probe tips for the instruments are made of a non-magnetic material (such as silicon) coated by a film of magnetic material (such as iron, cobalt, etc). However, both a shape and a structure of the coatings are nonoptimal for the high resolution and the high sensitivity of the instruments.

The SPM for electrical capacitance measurements uses probes that have silicon tips. However, both a shape of the tips and a composition of the capacitance material are not optimal for high sensitivity of the instrument.

SPM probes with side tips for profile studies are known. However, the probes are suitable only for studies of surfaces having rather simple forms such as grooves with vertical walls. However, there are a lot of cases where surfaces with complicated shapes (such as biological macromolecules) or with a coarse relief must be studied.

There are problems with mapping the spatial arrangement of chemical forces existing on solid surfaces.

Problems with ensuring high scanning rates in SPM devices having a single lever/probe are known. Due to the small scanning rate, such devices are not broadly used in the industry.

A multi-lever device has been proposed. In the device, a signal from each probe is treated in a microchip that is placed on a holder. After treating the signal, it is applied to a system for controlling a variety of levers. In this operation, piezoresistive layers are used. Drawbacks of the multi-lever device include the following:

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1. In order to realize both feeding/taking-off the levers and tracing their deflections, using only the piezoresistive layers is not sufficient.

2. Creation/production of the multilever devices integrated with multiplexers, operational amplifiers, etc (that is necessary for an effective action of the multi-lever devices) represents a very complicated and expensive technological problem.

A cantilever for a SPM, as well as techniques for a registration and for treatments of signals obtained, are known. In particular, a device is proposed that is based on a measurement of change of the capacity between the lever and neighboring stationary plane. The device includes also a controlled action to the lever by an electrostatic interaction between the stationary plane and the lever (Fig.). In this case, three principal tasks are solved:

-application of resonance modes to the lever when it acts in the taping mode;

-electrostatic feeding/taking-off the lever;

-control of the lever deflection by the measurement of the capacity.

However, sometimes, especially at the action of the SPM in the regime of the Claim scanning of adhesion forces, an ability of the device to ensure a fast damping of non-resonant oscillations, to damp the lever for its subsequent interaction with solid surface under study is very important. Such a property of the device, as well as a suitable design of the cantilever, can substantially (3-5 times) decrease the time of investigation of the surface.

In order to realize such a property, it is proposed to use an actuator-a part of the cantilever that is rigidly connected with its holder. When the probe is detached off the surface (where it was, e. g., "captured" by the adhesion forces), non-resonant oscillations of the lever arise. By measurements of changes of the capacity, existing between the lever and the actuator, the oscillations are applied to the input of the system that has a negative feed-back: a similar (by amplitude) and an opposite (in sign) signal is applied to the actuator. This results in the non-resonant damping of the lever osciliations and, finally, in its relaxation.

Please amend the first paragraph on page 4 as follows:

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Thus, there is a need for a scanning probe device that ensures a stable and fast action in any regimes of its work. In a preferred embodiment, the scanning probe device has a cantilever with a second electrode that applies the resonant modes of oscillations to the lever. This provides an advantageous design of the multi-lever and a non-expensive technology for its production.In a preferred embodiment, components of scanning probe devices (SPD) such as levers, probes on them, can be fractionized and separated from each of other by using a new technology for preparation of tip probes. It is possible to form multifunctional tip structures that allow to combine in a given device, a multilever, several probes with various sensitive components for simultaneous implementation of morphological, electrostatic, magnetic, and chemical investigations.

Please amend the paragraph on page 4, line 1 as follows:

<u>Summary of Certain Inventive Aspects</u>

Please amend the paragraph on page 10, line 1 as follows:

<u>Brief Description of the Drawings</u>

Please amend the paragraph on page 13, line 1 as follows:

<u>Detailed Description of Certain Inventive Embodiments</u>

On pages 21-22, please delete the section "References."

<u>IN THE CLAIMS:</u>

Please cancel Claims 1-74 without prejudice.

Please add new Claims 75-145 as follows:

a2

75. (New) A tip structure for an electron emissive device or a scanning probe device, comprising a single-crystalline substrate and a single-crystalline tip epitaxial to the substrate,